MICRONUTRIENT MAPPING IN IDAHO, WASHINGTON AND OREGON[1/]

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This project is a tri-state effort between soil scientists in Idaho, Washington, and Oregon with the goal of producing a soil-nutrient status map of each state for each essential plant micronutrient. Information collected by the University of Idaho, Washington State University and Oregon State University over the past 40 years has been evaluated and assembled to produce these maps so that this information will be accessible to people who deal with soil fertility and/or plant nutrition. These maps should aid growers, fertilizer dealers, county agents, and consultants in designing sound soil fertility management programs throughout the Pacific Northwest.

Five mapping units have been established for mapping micronutrients in the Pacific Northwest. These units include soils which are:

UNIT	RESPONSE (% of time)
OFTEN DEFICIENT	25-50%
OCCASIONALLY DEFICIENT	10-25%
SELDOM DEFICIENT	0-10%
NEVER DEFICIENT	0%
TOXIC AREAS	-

These units are based on the most responsive crop to a micronutrient in a given area. For example, in eastern Washington boron is mapped as often deficient. This area mapping unit is based on alfalfa - the most responsive crop in the area. The grower must recognize that other crops grown in this region such as wheat and barley are not as responsive to boron and should be treated appropriately.

Boron

Three mapping units are used to characterize soil boron levels in Idaho, Washington, and Oregon. Low levels of boron have been found to limit plant growth in several areas of the Pacific Northwest. Crops grown in parts of Idaho, Washington and Oregon have been shown to respond to boron fertilizer applications for more than 40 years.

[1/]Proceedings, 33rd Annual Fertilizer Conference, Northwest Plant Food Association, Boise, Idaho, July 13, 14, 1982.

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Agricultural soils west of the Cascades in Washington and Oregon and soils in eastern Washington and northern Idaho are mapped as often deficient (Figure 1). Soils in the Columbia Basin of Washington, eastern Oregon and in the Treasure and Magic valleys of Idaho are mapped as occasionally deficient. Conversely, soils in mountainous regions and southeastern Idaho are mapped as seldom deficient.

Plants belonging to the grass (cereals, corn) family generally need less boron than other crops. They usually require only about 25 percent as much boron for normal growth as do dicotyledons (beans, potatoes, tomatoes, sugarbeets). Boron deficiencies are usually most pronounced on alfalfa and on certain root and cruciferous crops (sugarbeets, cabbage, cauliflower, rutabagas, and turnips). More boron fertilizer is used on alfalfa than any other crop in the Pacific Northwest.

Chlorine

Deficiencies of chlorine on agronomic crops do not occur under field conditions in the Pacific Northwest. Therefore, never deficient is the mapping unit used in all of Idaho, Washington and Oregon. On a plant nutrient basis, soils in Idaho, Washington and Oregon contain adequate amounts of chlorine.

Copper

The mapping units often deficient, occasionally deficient and seldom deficient are employed to map the nutrient status of copper in Idaho, Washington and Oregon soils. Responses to copper fertilization occur in isolated areas of the Pacific Northwest.

Over 90% of the region is mapped as seldom deficient (Figure 2). Responses to copper are generally confined to areas where soils are relatively high in organic matter content. A small area in Bonner and Kootenai counties in northern Idaho is mapped as occasionally deficient. Here copper responses are confined to soils with an organic matter content greater than 8%. Soils in the Lake Labish, Lake Gaston, and Klamath Falls areas are mapped as often deficient in soil copper. These soils also have high organic matter contents. In the Lake Labish and Lake Gaston areas, onions are the most responsive crop, while potatoes, oats, and barley often respond to additions of copper in the Klamath Falls region.

Iron

Two mapping units are used to characterize available iron levels in Idaho, Washington and Oregon soils. Soils in the Columbia Basin of Washington and Oregon and in the Snake River Valley of Idaho and Oregon are mapped as occasionally deficient (Figure 3). Fruit trees tend to be the most iron sensitive plants.

Figure 1. The status of boron in Idaho, Oregon and Washington soils.

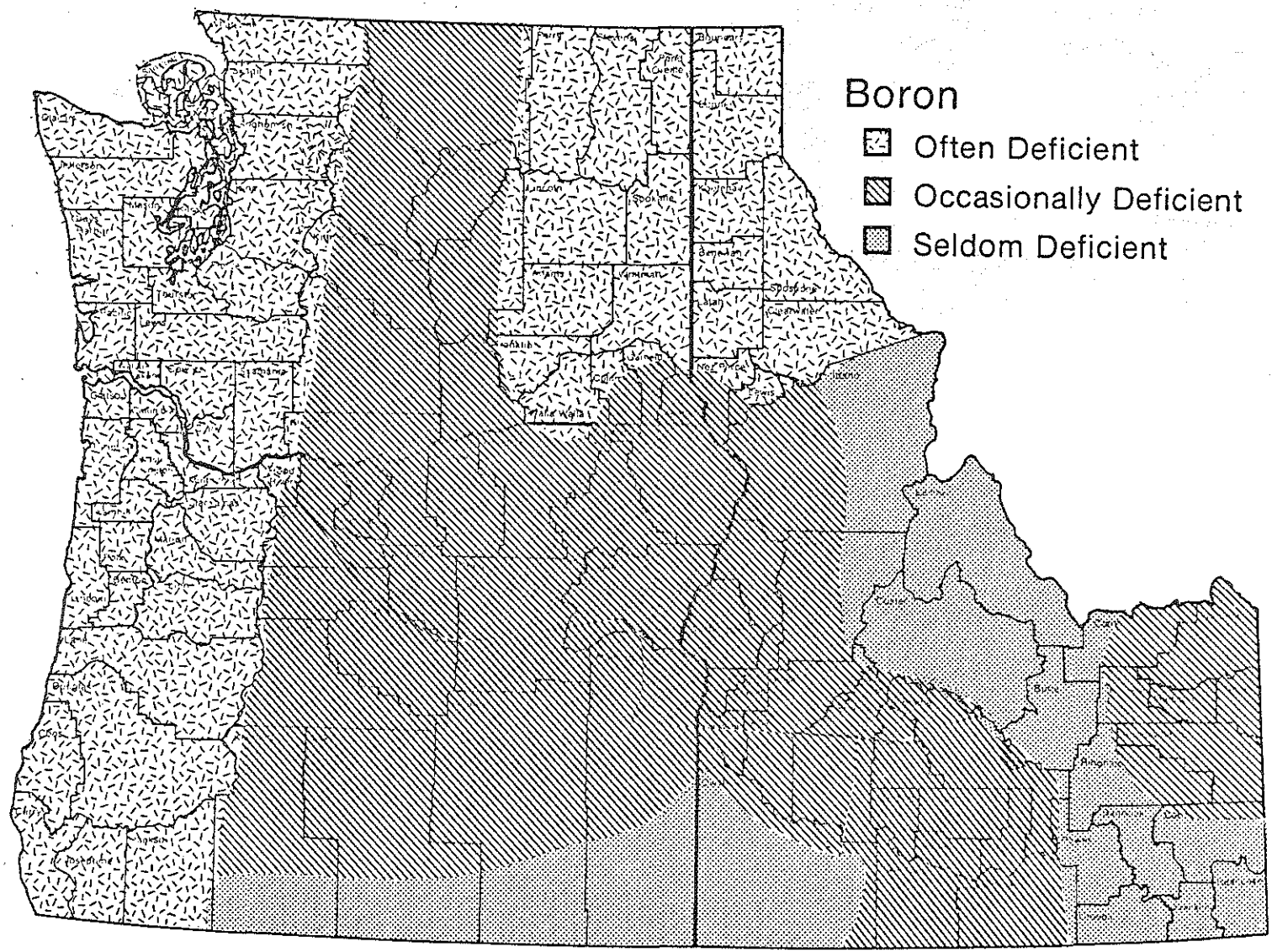


Figure 2. The status of copper in Idaho, Oregon and Washington soils.

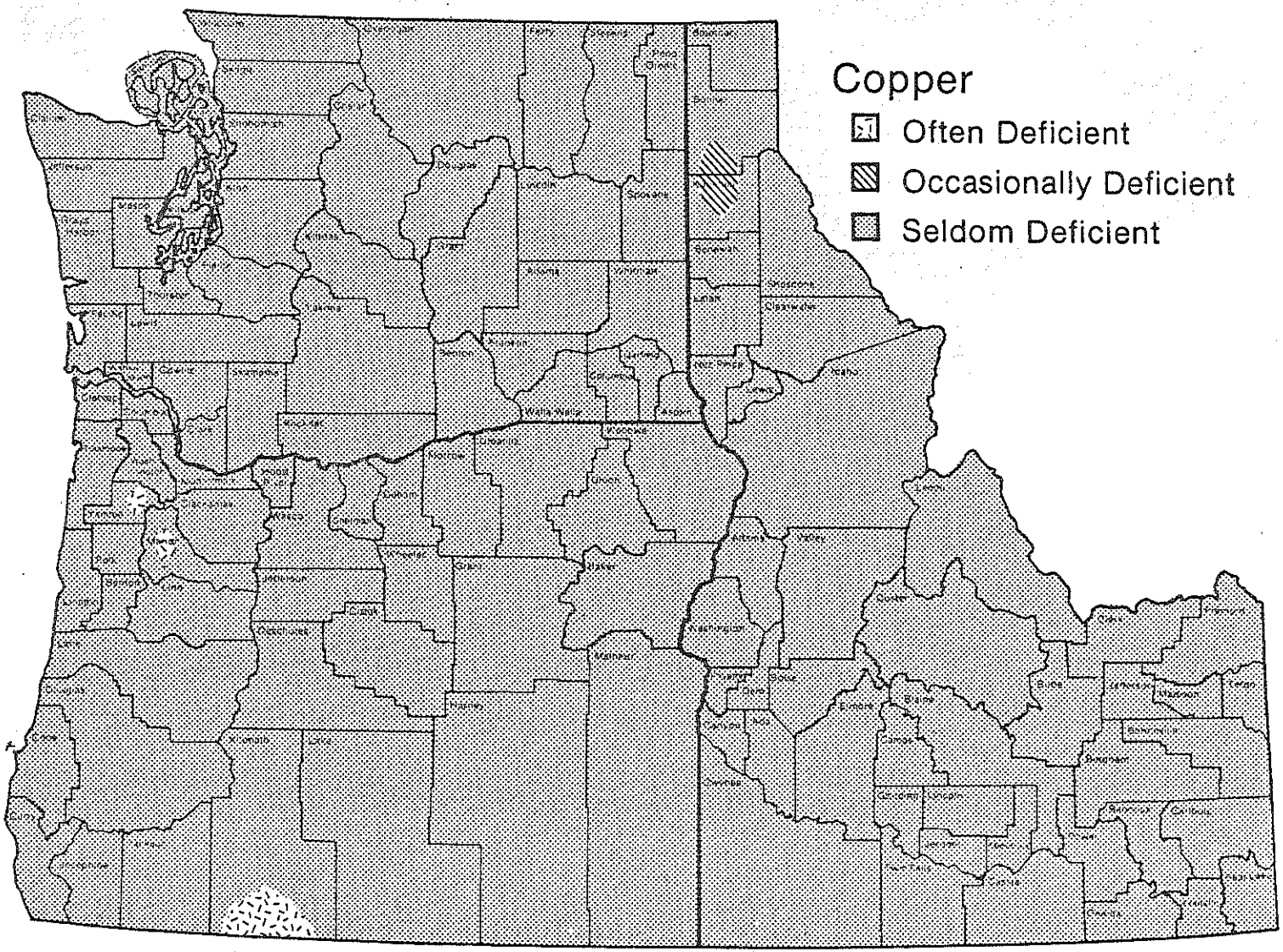
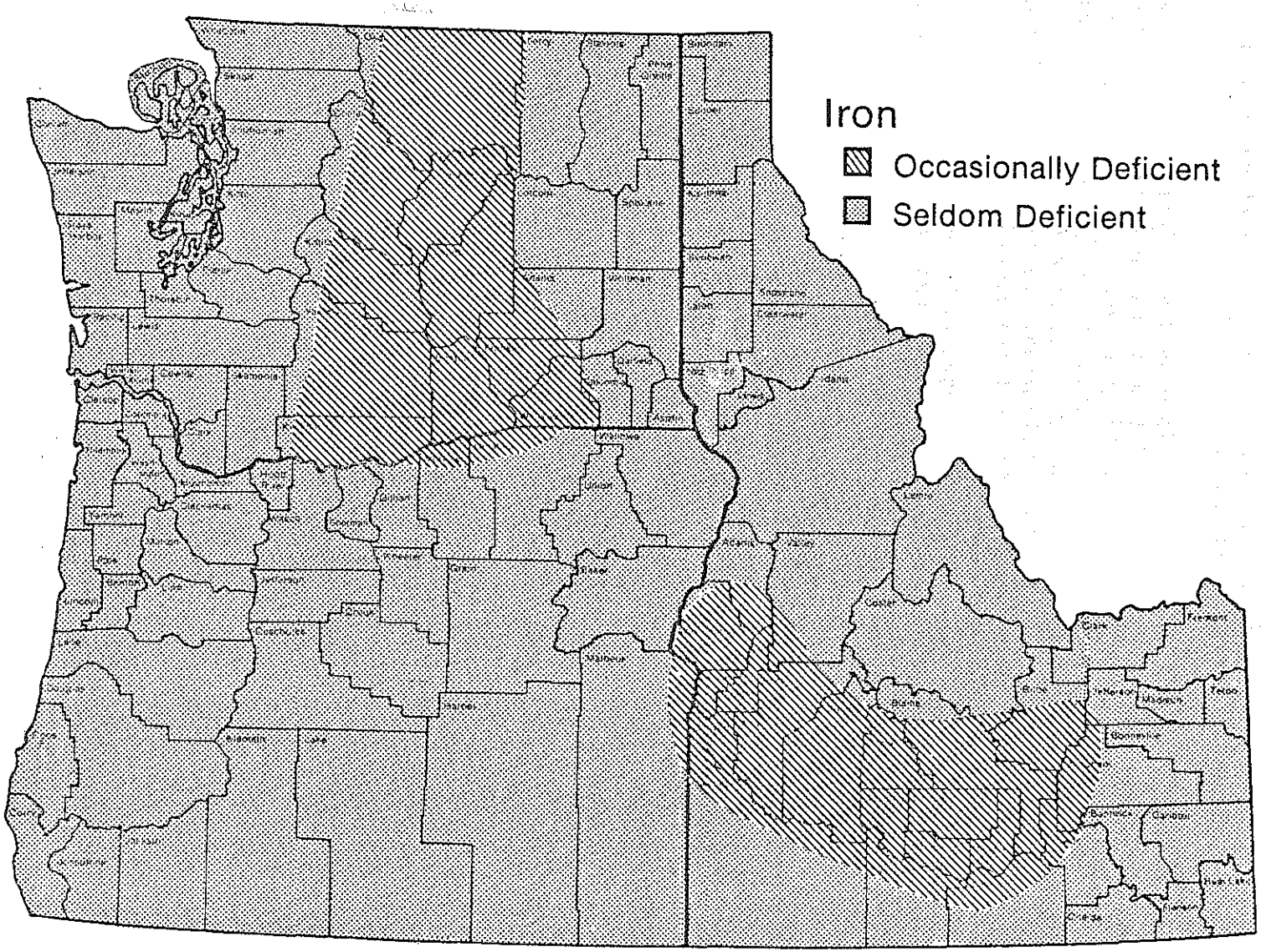


Figure 3. The status of iron in Idaho, Oregon and Washington soils.



Manganese

The mapping units often deficient, occasionally deficient and seldom deficient are used to map the nutrient status of manganese in Idaho, Washington and Oregon. Responses to manganese fertilization occur in isolated areas of Idaho, Washington, and Oregon.

Over 90% of the Pacific Northwest is mapped as seldom deficient (Figure 4). Manganese is mapped as occasionally deficient in Boundary and Bonner counties in Idaho, in northwestern Washington, and in the Lake Labish and Lake Gaston areas of Oregon (Figure 4). In northern Idaho, oats are the most sensitive crop to manganese deficiencies, while peas are most prone to be manganese deficient in northwestern Washington. In the Lake Labish and Lake Gaston areas in Oregon, onions are the most responsive crop.

The Klamath Falls area in southern Oregon is the only region mapped as often deficient. In this area potatoes, barley and oats are considered sensitive crops.

Molybdenum

Five mapping units including often deficient, occasionally deficient, seldom deficient, never deficient and toxicity zones are used to characterize the molybdenum status of soils in Idaho, Washington, and Oregon. Crops grown in parts of Idaho, Washington, and Oregon have been shown to respond to molybdenum applications for more than 25 years.

Agricultural soils in eastern Washington, northern Idaho, the western Willamette Valley of Oregon and areas in southwestern Oregon are mapped as often deficient in molybdenum (Figure 5). In eastern Washington and northern Idaho, peas, lentils and alfalfa are considered molybdenum responsive crops. Clover pastures are considered to be molybdenum responsive in southwestern Oregon. In the Willammette Valley of Oregon, forage legumes, cauliflower, cabbage and other cruciferous crops are considered molybdenum responsive.

Molybdenum is occasionally deficient in some parts of eastern Washington, northern Idaho and western Oregon. Soils in western Washington and southeastern Idaho are seldom deficient in molybdenum. Due in part to high soil pH, soils in eastern Oregon and southwestern Idaho should never be deficient in molybdenum.

Molybdenum is often present in toxic quantities in mountain valleys in Idaho.

Because molybdenum in present only in small amounts, soil molybdenum analysis is not commercially available. A good rule of thumb is to apply molybdenum to acid soils where legumes or cruciferous crops are in the rotation.

Figure 4. The status of manganese in Idaho, Oregon and Washington soils.

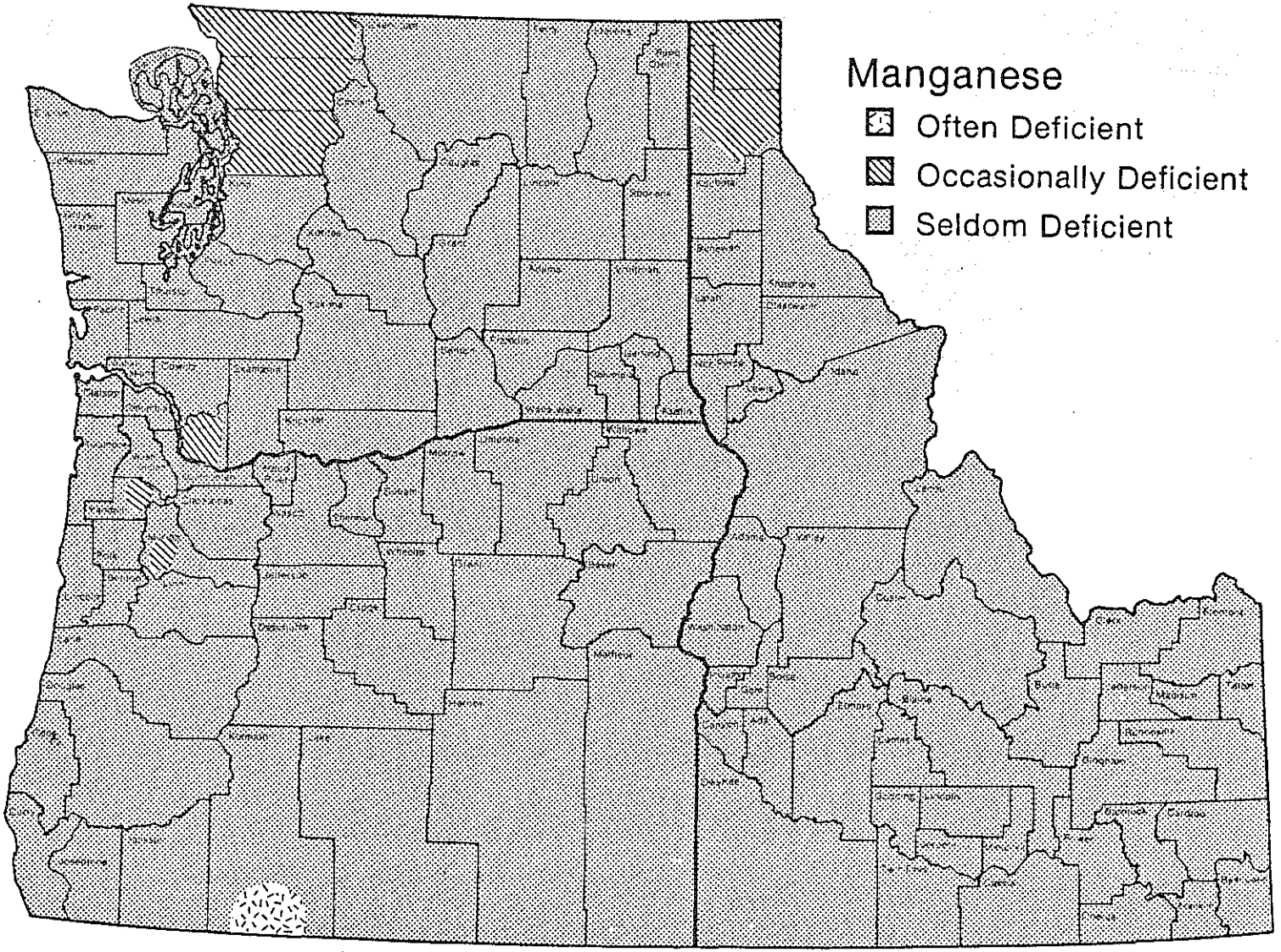


Figure 5. The status of molybdenum in Idaho, Oregon and Washington soils.

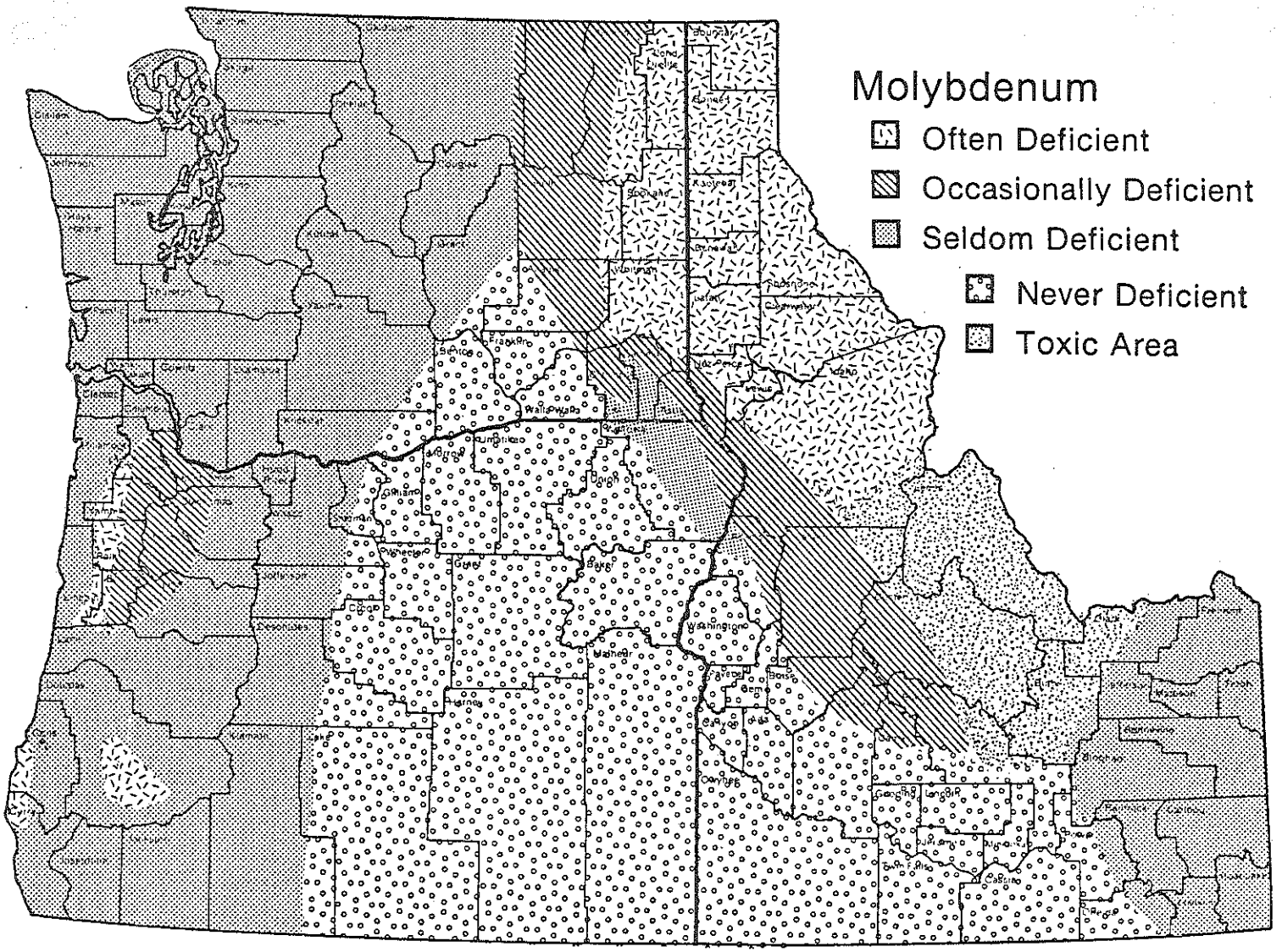
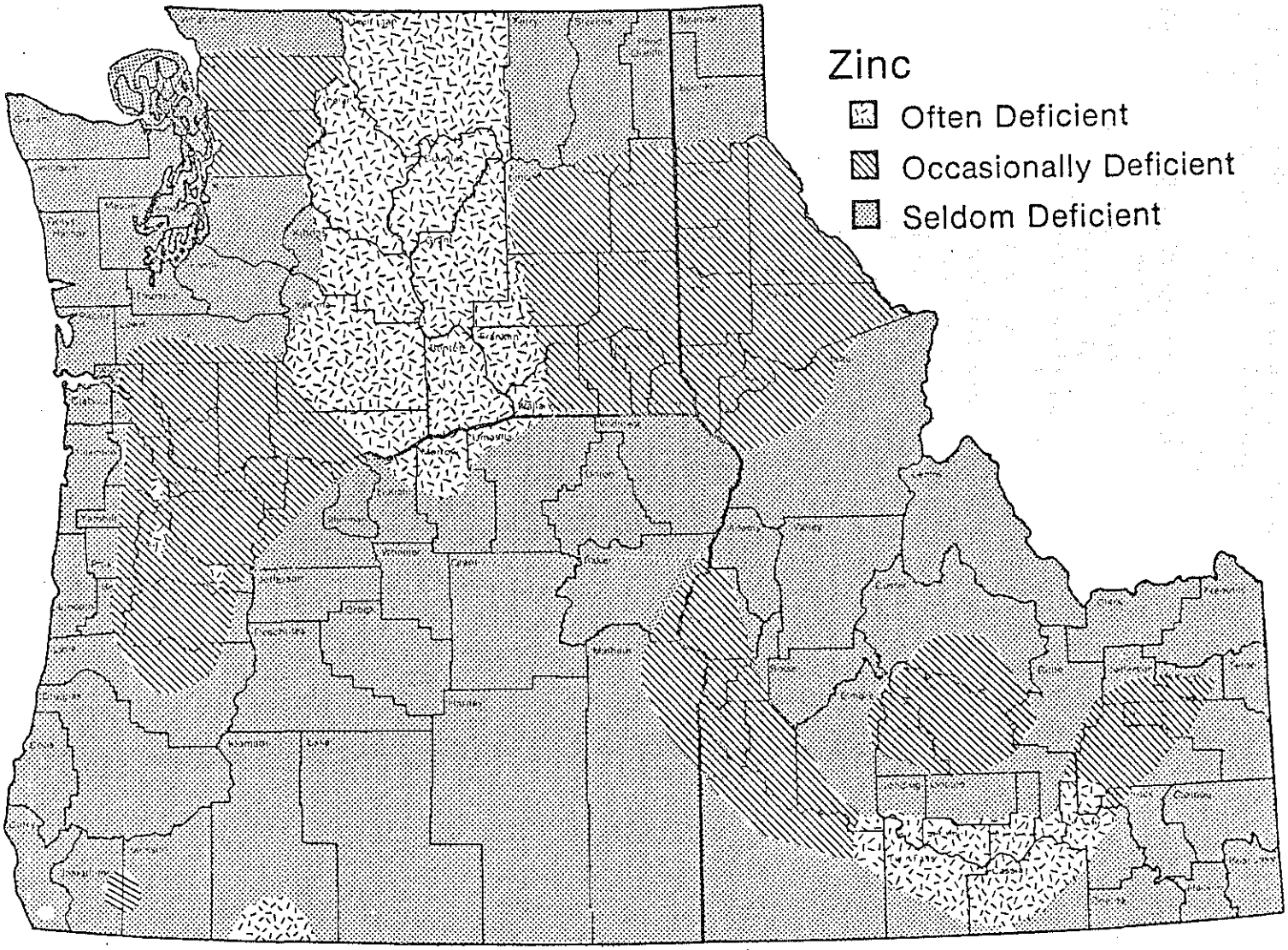


Figure 6. The status of zinc in Idaho, Oregon and Washington soils.



Zinc

The mapping units often deficient, occasionally deficient, and seldom deficient are used to map the nutrient status of zinc in Idaho, Washington and Oregon. Responses to zinc fertilization occur in large areas of Idaho, Washington, and Oregon.

The Columbia Basin in Washington and Oregon and Magic Valley in Idaho are mapped as often deficient in zinc (Figure 6). In the Columbia Basin and Magic Valley, beans and corn are the most zinc responsive crops; however, potatoes, sugar beets, tree fruits and hops are all considered responsive. In Oregon, isolated areas in the Willamette Valley and Klamath Falls area are also considered often deficient.

Large agricultural areas in Idaho, Washington, and Oregon are considered occasionally deficient. In western Washington and Oregon, corn and beans are the most responsive crops to zinc. In eastern Washington and northern Idaho, peas are considered responsive while in parts of southwestern Oregon and Idaho, tree fruits are responsive.

SUMMARY

These maps are the first attempt at summarizing the micronutrient status of soils in Idaho, Washington and Oregon in graphical form. Further refinements will be made in the future as new information becomes available and/or as a sharper focus is gained on the areas of nutrient deficiencies and degree of probability of response.